

Документ подписан простой электронной подписью  
Информация о владельце:  
ФИО: Ливанов Дмитрий Викторович  
Должность: Ректор  
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APPROVED  
Vice Rector for Academic Affairs

A. A. Voronov

Ministry of Science and Higher Education of the Russian Federation  
The Federal State Autonomous Educational Institution of Higher Education  
“Moscow Institute of Physics and Technology (National Research University)”

**ACADEMIC PLAN**

Qualification Master  
Year of enrollment 2023  
Statutory duration of a study course 2 years

**Domain of study: 01.04.02 - Applied Mathematics and Informatics**  
**Orientation (specialty): Advanced Methods of Modern**  
**Combinatorics/Продвинутые методы современной комбинаторики**  
**Phystech School of Applied Mathematics and Informatics**

**AGREED**  
Head of the Phystech School of Applied Mathematics and  
Informatics

A. M. Raygorodskiy

Partner organization: Faculty of Electronical Engineering, Mathematics and Computer Science, University of Twente

№ in order	Name of disciplines, practices, State Final Examination	Form of final control by semesters			Hours									Coursework and test papers	hours in week				TOTAL HOURS	Credit points		
		Examinations	Graded test ("_" - simple)			State Examination	Laboratory classes	of them					Hours for preparation and examinations		Distribution by courses and semesters					Total	Basic	Elective
								Total classroom sessions	Lectons	Laboratory classes	Practical lessons, seminars, exercises, etc.	Practice			Independent study	1 course		2 course				
			1 sem. 15 weeks	2 sem. 15 weeks	3 sem. 15 weeks											4 sem. 15 weeks						
			1	2	3			4	1	2	3	4			1	2	3	4				
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	
M.1	<b>Courses (Modules)/Дисциплины (модули)</b>																					
M.1.1	Foreign Languages/Иностранные языки					180	120		120		60		4					180	4	4		
				-1		90	60		60		30		2	4				90	2	2		
			2			90	60		60		30		2		4			90	2	2		
	<b>Humanitarian and Social Cycle/Гуманитарный и социальный цикл</b>					165	60	60			105	60	4					225	5	5		
M.1.2	Global Trends and Methods for Strategic Development in the Era of Uncertainty/Глобальные тренды и методы стратегического развития в эпоху неопределенности	1				60	30	30			30	30	2	2				90	2	2		
M.1.3	Digital Transformation: Social and Economic Challenges/Цифровая трансформация: социальные и экономические вызовы	2				105	30	30			75	30	2		2			135	3	3		
	<b>Specialty 1 Advanced Combinatorics/Продвинутая комбинаторика (Chair of Discrete Mathematics) including practical training</b>					4 365	765	345	420	3 030	570	270	2					4 635	103	68	35	
						3 030				3 030		30						3 060	68	68		
	<b>Specialty 2 Contemporary Combinatorics/Современная комбинаторика (Chair of Discrete Mathematics) including practical training</b>					4 425	795	390	405	3 030	600	210						4 635	103	68	35	
						3 030				3 030		30						3 060	68	68		
M.1.B.1	Scientific Workshop: Modern Topics in Applied Mathematics and Computer Science/Научный семинар: Современные проблемы прикладной математики и информатики			1		45	15		15		30			1				45	1		1	
M.3	<b>State Final Certification/Государственная итоговая аттестация</b>																					
M.3.1	Performance of and Defence of Graduation Thesis/Выполнение и защита выпускной квалификационной работы		4		4	285					285	30						315	7	7		

И.о. начальника учебного управления T. F. Artemenko

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Phystech School of Applied Mathematics and Informatics

Chair of Discrete Mathematics

AGREED

Head of the Phystech School of Applied Mathematics and Informatics

A. M. Raygorodskiy

Partner organization: Faculty of Electrical Engineering, Mathematics and Computer Science, University of Twente

Specialty: Advanced Combinatorics/Продвинутая комбинаторика

№ in order	Name of disciplines, practices, State Final Examination	Form of final control by semesters				Hours								Coursework and test papers	hours in week								TOTAL HOURS	Credit points												
		Examinations				Laboratory classes	of them						Hours for preparation and examinations		Distribution by courses and semesters									Total	Basic	Elective										
		Graded test ("-" - simple)		State Examination			Total classroom sessions	Lectures	Laboratory classes	Practical lessons, seminars, exercises, etc.	Practice	Independent study			1 course				2 course																	
		1	2	3	4										1	2	3	4	1 sem. 15 weeks	2 sem. 15 weeks	3 sem. 15 weeks	4 sem. 15 weeks					1 sem. 15 weeks	2 sem. 15 weeks	3 sem. 15 weeks	4 sem. 15 weeks						
		1	2	3	4	1	2	3	4	5	6	7	8	9	10	11	12	13	14	lect.	lab.	sem	lect.	lab.	sem	lect.	lab.	sem	lect.	lab.	sem					
M.1	Courses (Modules)/Дисциплины (модули)														1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22
M.1.1	Foreign Languages/Иностранные языки																																			
	Humanitarian and Social Cycle/Гуманитарный и социальный цикл																																			
M.1.2	Global Trends and Methods for Strategic Development in the Era of Uncertainty/Глобальные тренды и методы стратегического развития в эпоху неопределенности	1																																		
M.1.3	Digital Transformation: Social and Economic Challenges/Цифровая трансформация: социальные и экономические вызовы		2																																	
	Core science/Профильные дисциплины																																			
M.1.B.1	Discrete Structures/Дискретные структуры	1																																		
M.1.B.2	Theory of Probability/Теория вероятностей				1																															
M.1.B.3	Linear Algebra/Линейная алгебра				1																															
M.1.B.4	Introduction to Discrete Geometry/Введение в дискретную геометрию																																			
			2																																	
M.1.B.5	Extremal Combinatorics/Экстремальная комбинаторика		2																																	
M.1.B.6	Random Graphs. Part 1/Случайные графы. Часть 1				2																															
M.1.B.7	Random Graphs. Part 2/Случайные графы. Часть 2			3																																
M.1.B.8	Advanced Graph Theory/Современная теория графов		2																																	
	Matrix Algebra Methods and Applications to Computer Science and Engineering/Методы матричной алгебры и приложения к информатике и инженерии		2																																	
M.1.B.9	Game Theory/Теория игр			3																																
M.1.B.10	Additive Combinatorics/Аддитивная комбинаторика			3																																
M.1.B.11	Scientific Workshop: Modern Topics in Applied Mathematics and Computer Science/Научный семинар: Современные проблемы прикладной математики и информатики				1																															

№ in order	Name of disciplines, practices, State Final Examination	Form of final control by semesters												Hours										hours in week				TOTAL HOURS	Credit points				
		Examinations				Graded test ("-" - simple)				State Examination	Laboratory classes	of them						Hours for preparation and examinations	Coursework and test papers	Distribution by courses and semesters				Total	Basic	Elective							
		1		2		3		4				1		2		3				4		1 course					2 course		19	20	21	22	
		1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1 sem. 15 weeks	2 sem. 15 weeks	3 sem. 15 weeks	4 sem. 15 weeks	lect.	lab.	sem	lect.	lab.	sem						
1	2	3				4				5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22						
M.2	Practice/Практика										3 030					3 030		30							3 060	68	68						
M.2.1	Industrial Practice/Производственные практики										3 030					3 030		30							3 060	68	68						
M.2.1.1	Personal Research Project/Научно-исследовательская работа										3 030					3 030		30							3 060	68	68						
									2		1 035					1 035									1 035	23	23						
				3							960					960		30							990	22	22						
									4		1 035					1 035									1 035	23	23						
M.3	State Final Certification/Государственная итоговая аттестация										285						285	30							315	7	7						
M.3.1	Performance of and Defence of Graduation Thesis/Выполнение и защита выпускной квалификационной работы								4	4	285						285	30							315	7	7						
TOTAL:		Number of examinations and pass/fail tests				Obl.	Distribution of hours by type of lesson										10	Distribution of classroom hours per week by semester				5 400	Total number of credits										
	Examinations		Pass/Fail tests		ECs.		Distribution of hours of contact work by years and semesters		Total hours		Total number of credits																						
	Fixed (without State Final Examination)		2	5	4		5	3	1	5 040	960	405		555	3 030	1 050	360	23	27	14		120	84	36									
	Extracurriculars																																
State Final Examination					1																												
																		Distribution of hours of contact work by years and semesters				1 140											
																		Distribution of credits by years and semesters															
																		851				289											
																		378				473				255				34			
																		57				63											
																		14				43				33				30			

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A. M. Raygorodskiy

L.S.

A. A. Voronov

**Partner organization: Faculty of Electrical Engineering, Mathematics and Computer Science, University of Twente**

**Specialty: Contemporary Combinatorics/Современная комбинаторика**

№ in order	Name of disciplines, practices, State Final Examination	Form of final control by semesters				Hours								Coursework and test papers	hours in week								TOTAL HOURS	Credit points												
		Examinations		Graded test ("-" - simple)		Laboratory classes	of them					Hours for preparation and examinations	Distribution by courses and semesters								Total	Basic		Elective												
		1	2	3	4		1	2	3	4	Laboratory classes		Total classroom sessions		Lectons	Laboratory classes	Practical lessons, seminars, exercises, etc.	Practice	Independent study	1 course					2 course											
						1 sem. 15 weeks						2 sem. 15 weeks								3 sem. 15 weeks		4 sem. 15 weeks														
		1	2	3	4	1	2	3	4	5	6	7	8		9	10	11	12	13	14	lect.	lab.		sem.	lect.	lab.	sem.	lect.	lab.	sem.	lect.	lab.	sem.	19	20	21
M.1	<b>Courses (Modules)/Дисциплины (модули)</b>								1 785	990	450		540		795	240	8																2 025	45	9	36
M.1.1	<b>Foreign Languages/Иностранные языки</b>								180	120			120		60		4																180	4	4	
							-1		90	60			60		30		2			4												90	2	2		
	<b>Humanitarian and Social Cycle/Гуманитарный и социальный цикл</b>						2		90	60			60		30		2				4											90	2	2		
									165	60	60				105	60	4															225	5	5		
M.1.2	Global Trends and Methods for Strategic Development in the Era of Uncertainty/Глобальные тренды и методы стратегического развития в эпоху неопределенности	1							60	30	30				30	30	2	2														90	2	2		
M.1.3	Digital Transformation: Social and Economic Challenges/Цифровая трансформация: социальные и экономические вызовы		2						105	30	30				75	30	2			2												135	3	3		
	<b>Core science/Профильные дисциплины</b>								1 395	795	390		405		600	180																1 575	35	35		
M.1.B.1	Theory of Probability/Теория вероятностей						1		90	60	30		30		30			2	2													90	2	2		
M.1.B.2	Introduction to Combinatorics/Введение в комбинаторику	1							105	60	30		30		45	30		2	2													135	3	3		
M.1.B.3	Linear Algebra/Линейная алгебра						1		90	60	30		30		30			2	2													90	2	2		
M.1.B.4	Introduction to Graph Theory/Введение в теорию графов						1		90	60	30		30		30			2	2													90	2	2		
M.1.B.5	Fundamentals of Python Programming/Основы программирования на Python	1							105	60	30		30		45	30		2	2													135	3	3		
	<b>Elective Set of Courses 1/Блок дисциплин по выбору 1</b>								135	90	45		45		45																	135	3	3		
M.1.B.6	Random Graphs. Part 1/Случайные графы. Часть 1						2		135	90	45		45		45					3	3											135	3	3		
M.1.B.7	Applied Mathematical Modeling/Прикладное математическое моделирование						2		135	90					45																	135	3	3		
M.1.B.8	Machine Learning with Graphs/Машинное обучение на графах						2		135	90					45																	135	3	3		
	<b>Elective Set of Courses 2/Блок дисциплин по выбору 2</b>								105	60	30		30		45	30																135	3	3		
M.1.B.9	Advanced Graph Theory/Современная теория графов		2						105	60	30		30		45	30					2	2										135	3	3		
M.1.B.10	Game Theory/Теория игр		2						105	60					45	30																135	3	3		
	<b>Elective Set of Courses 3/Блок дисциплин по выбору 3</b>								90	45	15		30		45																		90	2	2	
M.1.B.11	Computability and Complexity/Вычислимость и вычислительная сложность						2		90	45	15		30		45					1	2											90	2	2		

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		Examinations				Graded test ("-" - simple)				State Examination	Laboratory classes	of them						Hours for preparation and examinations	Coursework and test papers	Distribution by courses and semesters								Total	Basic	Elective				
												Total classroom sessions	Lectiоns	Laboratory classes	Practical lessons, seminars, exercises, etc.	Practice	Independent study			1 course				2 course										
																				1 sem. 15 weeks	2 sem. 15 weeks	3 sem. 15 weeks	4 sem. 15 weeks	1 sem. 15 weeks		2 sem. 15 weeks								
																								lect.	lab.	sem	lect.					lab.	sem	lect.
1	2	3	4	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22									
M.1.B.12	Software Development and Data Engineering/Разработка ПО и системы хранения данных						2		90	45					45							90	2		2									
M.1.B.13	Machine Learning/Машинное обучение						2		90	45	15		30		45				1	2		90	2		2									
M.1.B.14	Applied Statistics/Прикладная статистика						2		45	15	15				30				1			45	1		1									
	<b>Elective Set of Courses 4/Блок дисциплин по выбору 4</b>								150	75	45		30		75	30						180	4		4									
M.1.B.15	Random Graphs. Part 2/Случайные графы. Часть 2			3					150	75	45		30		75	30					3	2			180	4		4						
M.1.B.16	Computer Vision/Компьютерное зрение			3					150	75					75	30						180	4		4									
	<b>Elective Set of Courses 5/Блок дисциплин по выбору 5</b>								105	60	30		30		45	30						135	3		3									
M.1.B.17	Additive Combinatorics/Аддитивная комбинаторика			3					105	60	30		30		45	30					2	2			135	3		3						
M.1.B.18	Natural Language Processing/Обработка естественного языка			3					105	60					45	30						135	3		3									
	<b>Elective Set of Courses 6/Блок дисциплин по выбору 6</b>								90	45	15		30		45							90	2		2									
M.1.B.19	Complex Networks/Сложные сети						3		90	45	15		30		45						1	2			90	2		2						
M.1.B.20	Algorithmic Game Theory/Алгоритмическая теория игр						3		90	45					45							90	2		2									
M.1.B.21	Reinforcement Learning/Обучение с подкреплением						3		90	45					45							90	2		2									
M.1.B.22	Applied Discrete Optimization/Прикладная дискретная оптимизация			3					105	60	30		30		45	30					2	2			135	3		3						
M.1.B.23	Scientific Workshop: Modern Topics in Applied Mathematics and Computer Science/Научный семинар: Современные проблемы прикладной математики и информатики						1		45	15			15		30				1			45	1		1									
M.2	<b>Practice/Практика</b>								3 030					3 030		30						3 060	68		68									
M.2.1	<b>Industrial Practice/Производственные практики</b>								3 030					3 030		30						3 060	68		68									
M.2.1.1	Personal Research Project/Научно-исследовательская работа								3 030					3 030		30						3 060	68		68									
							2		945					945								945	21		21									
				3					915					915		30						945	21		21									
								4	1 170					1 170								1 170	26		26									
M.3	<b>State Final Certification/Государственная итоговая аттестация</b>								285						285	30						315	7		7									
M.3.1	Performance of and Defence of Graduation Thesis/Выполнение и защита выпускной квалификационной работы						4		285						285	30						315	7		7									
TOTAL:		Number of examinations and pass/fail tests							Obl.	Distribution of hours by type of lesson							8	Distribution of classroom hours per week by semester				5 400	Total number of credits											
		Examinations			Pass/Fail tests																		Total hours											
		3	2	4	5	6	1	1		5 100	990	450		540	3 030	1 080		300	27	23	16			120	84	36								
										ECs.																								
		State Final Examination																																
	Distribution of hours of contact work by years and semesters																						TOTAL HOURS	Total number of credits										
848																	323					1 171												
445				403				289			34																							
Distribution of credits by years and semesters																																		
54																	66																	
17				37				33			33																							